common chord of circles O and O_1, passing through A, MC and NC, respective tangents in M and N, B point where OM and O_1N meet, the five points F, B, M, C, N, are on the same circle. That B, M, N. C are on the same circle is evident. Then $\angle AFM = \angle CMA$, $\angle AFN = \angle ANC$.

$\therefore \angle MFN = \angle CMA + \angle CNA = 180° - \angle C$, which proves that F is on circle $BMNC$, and therefore the proposition.

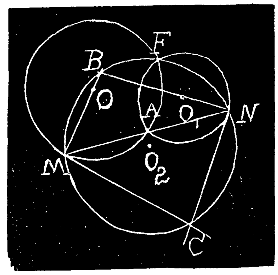


Fig. 2.

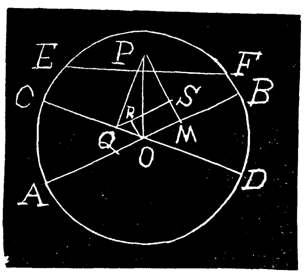
This is in all its generality, for we can readily see that B is the transformed of K_1K_2—line joining points where the tangents meet the respective directrices.

360. Proposed by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

A circular segment, area A, revolves successively about the diameters (fixed) d, d', intersecting at an angle θ. If v = volume about d, v' the volums about d', then $v^2+v'^2-2vv'\cos\theta$ is independent of the position of the segment.

Solution by S. LEFSEHETZ, East Pittsburg, Pa., and the PROPOSER.

Let P be the center of gravity of the segment; EF, its chord; O the center of the circle; and AB, CD, the diameters d, d', respectively; $\angle AOC = \angle BOD = \theta$.



Draw PQ perpendicular to CD, PM perpendicular to AB, QS perpendicular to PM, and OR perpendicular to QS.

Let $PQ=a$, $PO=c$, $PM=b$.

Then $b = PS+SM = PS+OR = a\cos\theta + \sqrt{(c^2-a^2)}\sin\theta$. $v=2\pi Ab$, $v'=2\pi Aa$.

$\therefore v^2+v'^2-2vv'\cos\theta = 4\pi^2A^2(a^2+b^2-2ab\cos\theta) = \triangle$.

$$\therefore \triangle = 4\pi^2A^2[a^2+a^2\cos^2\theta+2a\sin\theta\cos\theta\sqrt{(c^2-a^2)}+(c^2-a^2)\sin^2\theta-2a^2\cos^2\theta-2a\sin\theta\cos\theta\sqrt{(c^2-a^2)}].$$

Hence, $\triangle = 4\pi^2A^2c^2\sin^2\theta$.

Solved similarly by S. G. Barton, J. Scheffer, and A. H. Holmes.

CALCULUS.

Remark on 282, by F. H. SAFFORD, Ph. D., University of Pennsylvania.

The published solution of 282 is incomplete. It is valid for a *long* box, but with a *short* box, the outer corner, B, may not reach its maximum before the corner, A, in Dr. Zerr's figure *emerges* from the hall. See Fig. 2, page 186, October, 1907. In that figure, N is omitted but should be vertically *above* Q. S is the corner vertically *under* M. In line 2, page 187, omit b preceding the word, becomes.